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NATIONAL AERONAUTICS  
AND SPACE ADMINISTRATION  
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NASA-09310 (June 2004)  
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SECTION 09310

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SECTION 09310

CERAMIC TILE  
06/04

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NOTE: Delete, revise, or add to the text in this  
section to cover project requirements. Notes are  
for designer information and will not appear in the  
final project specification.  
  
This broadscope section covers ceramic tile walls,  
floors, and marble thresholds installed by  
conventional and thin-set setting methods utilizing  
portland cement or portland cement and adhesive  
mortars.  
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PART 1 GENERAL

1.1 REFERENCES

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NOTE: The following references should not be  
manually edited except to add new references.  
References not used in the text will automatically  
be deleted from this section of the project  
specification.  
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The publications listed below form a part of this section to the extent  
referenced:

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.1	(1999) Installation of Ceramic Tile, A Collection
ANSI A136.1	(2000) Organic Adhesives for Installation of Ceramic Tile
ANSI A137.1	(1988) Ceramic Tile

ASTM INTERNATIONAL (ASTM)

ASTM A 185	(2002) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM C 144	(2003) Standard Specification for Aggregate for Masonry Mortar

ASTM C 150	(2002ae1) Standard Specification for Portland Cement
ASTM C 171	(2003) Standard Specification for Sheet Materials for Curing Concrete
ASTM C 206	(2003) Standard Specification for Finishing Hydrated Lime
ASTM C 207	(2004) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C 241	(1990; R 1997e1) Standard Specification for Abrasion Resistance of Stone Subjected to Foot Traffic
ASTM C 424	(1993; R 1999) Standard Test Method for Crazing Resistance of Fired Glazed Whitewares by Autoclave Treatment
ASTM C 482	(2002) Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement
ASTM C 485	(1983; R 2003) Standard Test Method for Measuring Warpage of Ceramic Tile
ASTM C 499	(1978; R 2003) Standard Test Method for Facial Dimensions and Thickness of Flat, Rectangular Ceramic Wall and Floor Tile
ASTM C 648	(1998) Standard Test Method for Breaking Strength of Ceramic Tile
ASTM D 2103	(2003) Standard Specification for Polyethylene Film and Sheeting
ASTM D 226	(1997a) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

## 1.2 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01330, "Submittal Procedures," and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.

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The following shall be submitted in accordance with Section 01330, "Submittal Procedures," in sufficient detail to show full compliance with the specification:

SD-03 Product Data

Manufacturer's catalog data shall be submitted for the following items:

Wall Tile  
Ceramic Tile Trim  
Ceramic Floor Tile  
Marble Thresholds  
Mortar  
Grout Materials  
Membrane Materials  
Metal Reinforcement Materials

#### SD-04 Samples

Manufacturer's Standard Color Charts shall be submitted for ceramic tile in accordance with paragraph entitled, "Materials," of this section.

[\_\_\_\_\_] full-size samples of each type, color and pattern of Wall Tile, Ceramic Floor Tile, and Ceramic Tile Trim.

[\_\_\_\_\_] samples not less than 8-inches 200 millimeter long of Marble Thresholds.

#### SD-07 Certificates

Certificates shall be submitted for the following items showing conformance with the referenced standards contained in this section.

Wall Tile  
Ceramic Tile Trim  
Ceramic Floor Tile  
Marble Thresholds  
Mortar  
Grout Materials  
Membrane Materials  
Metal Reinforcement Materials

## PART 2 PRODUCTS

### 2.1 MATERIALS

Manufacturer's Standard Color Charts shall be submitted for ceramic tile showing the manufacturer's recommended color and finish selections.

#### 2.1.1 Grout Materials

Grout for glazed wall and ceramic mosaic tile shall be a commercial portland cement grout mixture conforming to ANSI A108.1.

#### 2.1.2 Membrane Materials

Waterproofing membrane shall be [15-pound, 33 kilogram, asphalt-saturated building felt conforming to ASTM D 226, Type I] [4-mil 0.0102 millimeter polyethylene film conforming to ASTM D 2103].

### 2.1.3 Metal Reinforcement Materials

#### 2.1.3.1 Welded Wire Fabric

Reinforcing for mortar bed shall be plain, cold-drawn welded steel wire conforming to ASTM A 185, in [2 by 2 inch by No. 16 U.S. steel wire gage (AWG)] [50 by 50 by 1.25 millimeter (No. 16 gage AWG)] [3 by 3 inch No. 13 AWG] [75 by 75 by 1.8 millimeter (No. 13 gage AWG)] [1-1/2 by 2 inch by No. 16 AWG]. [38 by 50 by 1.6 millimeter (No. 16 AWG)].

#### 2.1.3.2 Metal Lath

Expanded-steel lath shall be painted, self-furring, shall weigh not less than 2.5 pounds per square yard, 1.36 kilogram per square meter, and shall conform to ANSI A108.1.

### 2.2 COMPONENTS

#### 2.2.1 Tile

##### 2.2.1.1 Wall Tile

Standard grade, [bright glazed] [matte-glazed] units conforming to ANSI A137.1 shall be not less than 5/16 inch 8 millimeter thick; cushion edge; with spacer lug construction.

Wall tile shall have nominal face dimensions as follows:

4-1/4 by 4-1/4 inch 108 by 108 millimeter  
6 by 4-1/4 inch 152 by 108 millimeter  
6 by 6 inch 152 by 152 millimeter

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**NOTE: Manufacturer will provide actual dimensions.  
Information only.**  
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Wall tile characteristics (using procedures of ANSI A137.1):

Structural Defects: Standard Grade tile shall be inspected from a distance of 2 feet 600 millimeter from the table to identify edge cracks. Small cracks parallel to the face must be less than 1/2 inch 12.7 millimeter.

Facial Defects: Testing framework shall consist of 80 pieces of 4-1/4 by 4-1/4 inch 108 by 108 millimeter tile in ten vertical columns 40 pieces of 6 by 6 inch 152 by 152 millimeter. Inspector shall stand 36 inch 915 millimeter away from the framework and follow the procedure as outlined in ANSI A137.1.

The range of major thickness in a sample lot shall not exceed 0.031 inch 0.79 millimeter using ASTM C 499. Craze Resistance shall be according to ASTM C 424 where 150 psi 1034 kPa shall be used for one cycle. Average Bonding Strength shall be 50 psi 345 kPa or greater, using ASTM C 482. Average Breaking Strength shall be 90 pounds force 400 newton or greater as per ASTM C 648.

#### 2.2.1.2 Ceramic Floor Tile

Standard grade, unglazed, impervious porcelain-type ceramic mosaic tile shall conform to ANSI A137.1. Water absorption shall not exceed 0.5 percent. Tile shall be nominal 1/4-inch 6.4 millimeter thick; cushion edge; factory mounted on sheets.

Floor tile shall have nominal face dimensions as follows:

3 by 3 inch 75 by 75 millimeter

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**NOTE: Manufacturer to provide actual dimensions.  
Information only.**  
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Floor Tile Characteristics are outlined in ANSI A137.1 and are the same as wall tile except:

The range of major thickness in a sample lot shall not exceed 0.040 inch 1.02 millimeter using ASTM C 499. Average breaking strength shall be 250 pounds force 1112 newton or greater as per ASTM C 648.

#### 2.3 ACCESSORIES

##### 2.3.1 Ceramic Tile Trim

Trim shall be of the same material as ceramic wall tile and shall conform to ANSI A137.1.

According to ASTM C 499, thickness shall be measured on flat portions 1/2 inch 12.7 millimeter from the edges. Range of major thickness is not to exceed 0.031 inch 0.79 millimeter for wall tile trim and 0.040 inch 1.02 millimeter for floor tile trim. The average reported thickness shall be within 0.02 inch 0.51 millimeter of the average reported wall or floor tile average thickness.

Warpage using ASTM C 485, shall be measured 3/8 inch 9.5 millimeter from the edge. Crazing Resistance shall be per ASTM C 424 using 150 psi 1034 kPa for one cycle. Bonding strength shall be equal to or greater than 50 psi 345 kPa using ASTM C 482.

Trim shapes shall be provided at external and internal corners; at head, jamb, and sills of openings; and as follows:

Base trim shall consist of sanitary cove units.

Trim at top of surface mounted tile wainscots shall be surface bull nose shapes.

External corner trim shall be cap shapes.

Internal corner trim shall be cap shapes of square corner, combination angle, and stretcher type.

##### 2.3.2 Marble Thresholds

Marble shall be Marble Institute of America (MIA), Group A, not less than 7/8-inch 22 millimeter thick, profile, hone finish, and shall match the

approved sample in color, finish, and quality. Abrasion resistance shall be not less than 12.0 when tested in accordance with ASTM C 241.

## 2.4 MIXES

### 2.4.1 Portland Cement Mortar

Cement shall conform to ASTM C 150, Type I.

Aggregate shall be washed, sharp, uncoated natural sand conforming to ASTM C 144. Aggregate used shall be so graded that not less than 100 percent of the aggregate passes a No. 8 2.36 millimeter sieve, and 95 percent of the aggregate passes a No. 16 1.18 millimeter sieve.

Lime shall conform to ASTM C 206 and ASTM C 207, Type S.

Water shall be potable.

Mortar shall conform to ANSI A108.1.

### 2.4.2 Dry-Set Portland Cement Mortar

Mortar shall conform to ANSI A108.1.

### 2.4.3 Organic Adhesive Mortar

Mortar shall conform to ANSI A136.1, Type I.

## PART 3 EXECUTION

### 3.1 PREPARATION

Before commencing work, field pattern and border line locations shall be established and the work shall be centered symmetrically so that no tile need be cut to less than half size. Joints in wall tile shall be aligned vertically and horizontally; staggered joints will not be accepted.

#### 3.1.1 Protection

Tile and areas to receive tile shall be maintained at a minimum temperature of 60 degrees F 16 degrees C for not less than 2 calendar days before starting work and not less than 3 calendar days after completion.

#### 3.1.2 Covering Tile Floors

Tile floors shall be covered, after grouting and cleaning, with kraft paper or polyethylene-curing covers conforming to ASTM C 171. Adjoining sheets shall be side-lapped not less than 6 inches. 150 millimeter. End laps shall be not less than 12 inches. 300 millimeter. Cement or tape joints to form a continuous membrane.

Floor covers shall be maintained in good condition.

### 3.2 INSTALLATION

Installation and workmanship shall be in accordance with [ANSI A108.1, Installation of Ceramic Tile with Portland Cement Mortar], [ANSI A108.1, Installation of Ceramic Tile with Dry-Set Portland Cement Mortar], [ANSI A108.1, Installation of Ceramic Tile with Organic Adhesives]. Printed

instructions of manufacturer's of commercial mortars and grouts shall be followed.

#### 3.2.1 Setting Marble Threshold

Marble thresholds shall be set in a portland cement mortar bed not less than 3/4-inch 19 millimeter thick and aligned to a true and level surface. Finished surface shall be protected until completion of work.

### 3.3 FIELD QUALITY CONTROL

#### 3.3.1 Tests

Finished tile installation shall display no uneven surfaces or high or low spots in excess of 1/8 inch in 8 feet 3 millimeter in 2438 millimeter when measured with an 8-foot 2438 millimeter straightedge in any direction. Tile floors pitched to a floor drain shall be measured at any point along an 8-foot 2438 millimeter radius from the floor drain.

### 3.4 SCHEDULES

#### 3.4.1 Repairing

Damaged and unacceptable portions of completed work shall be removed and replaced with new work to match adjacent surfaces at no additional cost to the Government.

#### 3.4.2 Cleaning

Upon completion of setting and grouting, tile shall be sponged and washed thoroughly and polished with clean, dry cloths.

Surfaces of the work, and adjacent surfaces soiled as a result of this work, shall be cleaned. Equipment, surplus materials, and rubbish from the work shall be removed from the site.

-- End of Section --